

Applying Experimental Archaeology to Ethnomusicology: Recreating an Ancient Maya Friction Drum through Various Lines of Evidence

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Portion of K5233

Introduction

In *The Code of Kings* (1998), Linda Schele and Peter Mathews examine religious buildings in seven different cities of the Classic and Post-Classic Maya periods. Their analysis includes all aspects of Maya elite life. Musical practices, including dance, were open to discussion. Among one of the book's color plates was one polychrome vase, on which was depicted a dancer and two instrumentalists. The caption for "Figure 11" reads, simply, "Dance with drums, string instrument, and conch trumpet" (Schele & Mathews 1998:Figure 11). This is the vase designated by Justin Kerr as his vase number K5233, MS Number 1720. Added to his database in 1996, the vase is described as showing "A ruler

dancing while looking into a mirror. He is accompanied by two musicians who play a stringed instrument and a rasca."

This "stringed instrument" is peculiar in that no chordophones are known by anthropologists to have existed in Pre-Contact America. This, however, is not a "stringed instrument," per se. Instead, this object is most likely a friction drum (Rene Lysloff, personal communication), an object also not known to have existed in Pre-Contact America.

The idea of the friction drum has been discussed in the archaeological literature before. Arturo Chamorro (1984), Roberto Rivera y R. (1980) and Norman Hammond (1972) each report that there was no evidence of any friction drum in the New World before the introduction of the kwita and zambomba with the influx of West Africans and Iberian peninsula Europeans. Most of those above-mentioned authors trace the outline-categorization of musical instruments according to the Hornbostel-Sachs system:

1. Idiophones
2. Membranophones
3. Chordophones
4. Aerophones [adapted from Rivera y R. 1980:9]

Within the "membranophone" classification we find the following:

2. Membranophones
 21. Sound made via percussion
 - 21 direct percussion
 - 1.
 - 21 indirect percussion
 - 2.
 22. Sound made via "plucking"
 23. Sound made via friction
 - 23 with a stick inserted
 - 1.
 - 23 with wood or thread inserted
 - 2.
 24. Sound made via sound waves [adapted from Rivera y R. 1980:13]

According to Rivera y R., two friction drums are currently known to exist in modern Mesoamerica. One, the tigrero, is a non-indigenous implement, probably akin to the European zambomba, and is used to scare away jaguars. The second, a drum from San Pedro Amuzgos in Pitla-Oaxaca, appears to be of African origin, and is a

Central American cousin to the Brazilian *cuíca* and the Cuban/Ghanaian *ekué* / *etwie* (Chamorro 1984:92-93).

A Working Definition of the Friction Drum

How can we be sure that what is depicted on K5233 is in fact a friction drum? According to the New Grove's Dictionary of Musical Instruments (1984), the friction drum is "a membranophone sounded by friction, either direct or indirect" (v. 1, p. 797). But this definition is deceptively "complex," as entry writer James Blades goes on to demonstrate.

Its body may consist of a bucket with the bottom removed or of an earthenware pot. The membrane on direct friction drums is rubbed either by the hand, which may be wet or rosined, by a leather 'plectrum' or by a stick which passes back and forth through a hole in the membrane. The membrane on indirect friction drums is made to vibrate by friction on a cord or stick in contact with the drumhead.

If a stick is used, the membrane is vibrated by rubbing the stick with wet or rosined fingers, twirling it between the palms or pulling it to and fro. Pressure on the stick varies the pitch. In the indirect method, the stick either stands upright, pinned or tied to the center of the unbroken membrane (Fig. 1a), or it extends (and is secured) through a hole in the membrane into the resonating chamber and is vibrated from below (Fig. 1b). In other types (e.g., the Brazilian *cuíca*) both direct and indirect friction are used; the stick itself is rubbed and is also used to rub the membrane (Fig. 1c). If a cord is used it is either threaded through the membrane and knotted (as in Fig. 1d) or tied to a small peg or disc (Fig. 1e), or threaded through one hole and out of another (Fig. 1f). The cord may be made of horsehair and may be waxed, rosined or rubbed by wet or rosined fingers. In some types of drum the cord is fastened round the neck of a stick (as in Fig. 1g); when the instrument is whirled around, friction between the stick and the cord makes the drumhead vibrate. [Ibid.:797-798]

Using this definition, I reason that the instrument depicted on K5233 is an indirect friction drum, of the type depicted in Blades Figure 1g. This friction drum is slightly different from that described in the definition, however, for instead of being whirled around like a bullroarer, it appears to be dangled from said stick while a second, notched stick is rubbed against it. But like most of those, I am willing to postulate, Blades notes that one important use of the friction drum is in a religious context, due to "the rather unearthly character of its sound" [Ibid.:798]

In the pages that follow I will be examining this Maya friction drum through three avenues: first, through a brief look at how membranophones were used among the Maya before the Conquest; second, a more in-depth analysis of the use of membranophones elsewhere in the world, and in what contexts; and third, a description of my own attempt to replicate the drum pictured on K5233, and what that experiment has told me.

Music & Membranophones in Ancient Mesoamerica

Musicians in Pre-Contact Mesoamerica were members of an élite class. As Stevenson (1976) points out, we can tell from the accounts of Spanish missionaries the following:

"[Musicians belonged to a] professionalized caste, similar to the Levitical guild in ancient Israel, [and] controlled public musical life."

"Training of an extremely rigid kind was prerequisite to a career in music; since music itself was always thought of as a necessary adjunct to ritual, absolutely perfect performances, such as only the most highly trained singers and players could give, were demanded."

"Imperfectly executed rituals were thought to offend rather than to appease the gods, and therefore errors in the performance of ritual music, such as missed drumbeats, carried the death penalty."

"Singers and players [and, at least for the Maya, courtly dancers], because of the important part music played in [ritual] life, enjoyed considerable social prestige" [p.89].

It must also be noted that, at least among the Aztecs (the subject of Stevenson's analysis), there was no a cappella music, and all music was accompanied by dance; the two were inseparable. Also, musical instruments could accrue manna (supernatural power) over time. These generalizations may be applied to the Classic Maya, as to most complex cultures throughout Mesoamerica.

According to many different sources, Mesoamerica featured three types of musical instruments: aerophones, or in this case flutes, examples of which abound throughout the archaeological record; membranophones, or percussion instruments which made a sound when a skin stretched over it was struck, best exemplified by the huehuetl; and idiophones, which made sound by themselves being struck. There are various examples of Mesoamerican idiophones, including all rattles, the áyotl (or tortoise shell), and most importantly, the teponaztli, often paired with the huehuetl (see Stevenson 1976).

The most common huehuetl was a three-legged membranophone usually made from wood or clay, and possibly other materials such as gold-those made of gold were often miniature, and worn into battle. A deerskin was draped over the top while the bottom was left open. When struck, the instrument emitted one of two sounds: a higher note if struck near the rim, a lower one if struck near the center of the skin. The two notes were, by Western musicological measurements, a fourth or fifth apart, as observed both by sixteenth-century observers and twentieth century ethnomusicologists who played reconstructed huehuetls.

The huehuetl was such an honored instrument that song writers sometimes called it "a book from which flowers bloom", or "adorned with quetzal feathers and braided with flowers of gold". The huehuetl, according to Stevenson, "captured every mood; but best of all it incited to sacrificial heroism". Small ones were even worn in battle by the likes of Aztec emperor Itzcóatl and nearby Tetzcocono ruler Nezahualcóyotl, according to Diego Durán. The drum came in all sizes, from that worn in battle to the tlalpanhuehuetl, which had to be played with the drummer standing up. Mendoza and Castañeda (1934) say that the average symphonic kettledrum emits a sound about an octave lower than the typical museum huehuetl, and some Mixtec codices actually depict huehuetls in this shape.

The Maya Huehuetl, or Pax

In the various Mayan languages spoken today and at the time of the Conquest, the huehuetl used in that part of the world was known as the pax. Norman Hammond (1972) details several types of pax found in archaeological or artistic contexts. The most common one is more or less similar to the Aztec huehuetl, only taller and more slender on the average. Usually made of wood or clay, unfortunately none from the Maya region survive to this day. However, Hammond does note at least three depictions of them in the art:

"The most detailed and exact dates from the end of the Classic and is in Room 1 of Structure 1 at Bonampak which shows a drum with a cylindrical body and a triple molding just over halfway down... The body was probably made by hollowing out a tree trunk, a much easier process than making a tunkul [the Maya teponaztli, or slit drum] with its integral sounding-tongues. The drum comes up to the chest of the player." [p. 127]

"Another Late Classic representation is on a polychrome cylinder vase from Chamá, Alta Veracruz, which shows four animal-impersonators of whom three play musical instruments. One, dressed as an armadillo, beats with both hands on an upright drum

of cylindrical form, with a basal aperture and a decorated band just above it. The membrane has a reticulate pattern which suggest the use of snakeskin. The figures are much smaller and more stylized than those at Bonampak..." [Ibid.]

"A Postclassic depiction of the pax existed on the Santa Rita frescoes, beaten by the merchant god Ek Chuah with one hand while the other waved a rattle and the god of 8 Ahau [the first day of the Maya solar year] swung two trophy heads in time to the beat. The drum has a frayed top, bulbous body and splayed pierced back but the design is stylized, with sound shown emerging from the top of the drum and from the body through the mouth of a skull. This may be a visual reference to the "hoarse sound" of the pax described by the Spaniard Herrera." [Ibid.]

Unlike the "high" drum (between 1.3 and 1.8 m tall and 37 to 43 cm in diameter), a similar "low" drum which frequently appeared in other parts of Mesoamerica (as can be seen in the Codex Becker) is not known in the Maya area. But just as the Aztecs used miniature drums in battle, so too did the Maya know of small, hand-held membranophones. In the Madrid Codex, we see a bulbous mini-pax like that depicted from Santa Rita being played. The painter depicted it as brownish-pink, hinting that it was made of ceramic (Ibid.)

In addition to these cylindrical and bulbous "pot-bellied" paxob, we see other, more intricately-shaped membranophones from the Maya area, both taken from the archaeological record and exhibited in Pre-Contact art. One is dubbed by Hammond the "lamp-glass" variety and found in various parts of the Maya Lowlands: Barton Ramie, Belize; and Uaxactún were homes for these lamp-glass drums. Double drums have been found in Usulután, Honduras; and in the Codices Dresden and Madrid. The other type of drum, a goblet-shaped "pedestal-vase" drum, has also been found in various contexts, in Barton Ramie, Uaxactún, Tabasco, Campeche, Piedras Negras, and Jaina. These "goblet" drums, all of which are monochrome, are not found doubled up (Ibid, pp. 127-128).

In each instance of a drum being depicted in art, said drum is always shown in a religious or other ritual context, implied or explicit. Some outright depict gods or animals playing or, in one instance (the Codex Madrid, p. 74b), making the drums. This instance was mistaken by one scholar as proof that the Maya had friction drums similar to the Brazilian cuíca, but was unlikely given the origin of that particular drum (Hammond 1972:131).

Although not the focus here, I must note the use of ?friction idiophones?, instruments that are percussed while attached to a

larger resonating chamber. Several of these can be seen from Mesoamerica, such as an armadillo-shell rasp attached to a gourd from Colima in West México, dating to ca. 900 BC (Karl A. Taube, personal communication). The Mixtec Codex Vindobonensis also shows such a rasp, this time attached to a human skull. Similar ones can be found outside of Mesoamerica, such as in the Hopi region of Arizona. Surely there are other examples around the world, but I have not investigated them and will save their discussion for another time. Taube has pointed out to me that the instrumentalist behind the friction drummer on K5233 is likely playing one of these instruments, identified by Kerr as a *rasca*, also illustrated in other works of Maya art. Upon initial analysis, I am inclined to agree.

Returning to the friction drum: aside from Mesoamerica, we know that this particular type of drum has ancient roots on three continents: Africa, Asia, and Europe.

Eurasian friction drums

Most recorded instances of friction drums in Asia are in India and points westward, but with sparse examples noted as far east as China. Blades notes that one of the earliest depictions of a friction drum in an archaeological context is that of a sixth century Babylonian monkey god playing the instrument (Rimmer 1969:Pl. VI.d.). The monkey appears to be using a stick, implying this is a direct friction drum. One friction drum in South Asia is the *der* of Maharashtra, Western India. Used in a folk dance in that region, it is played by rubbing two palm leaves that stick up from the membrane. Similar friction drums are found in Orissa (the *baghra*) and Rajasthan (the *nar hunkarnio*) (Grove's 1984:v. I, p. 557).

In Europe, examples of friction drums have been found dating to the Neolithic. Harrison and Rimmer (1964) show us several friction drums. One is a reconstruction of a Neolithic friction drum from Naples with a long, thin stick extending from the middle. Its modern cousin is used at the Fiesta of the Madonna of Piedigrotta (Harrison and Rimmer 1964:Plate 9). Similar ones can be found in various parts of Europe, especially the Mediterranean, where examples are used in rural Portugal and Spain, such as the Portuguese *sarronca*, a variant of the *zambomba* (Veiga de Oliveria 1966:210-219, and Figures 314 - 325). Others were clear examples of friction drums swung on strings, used today as toys. The authors include modern-day pictures of such toys from France and Norway (Ibid.:Pl. 10). Examples include the German *Waldteufel* and the *toulouhou* of the French Pyrenees (Grove's v. III, p. 466; v. III, p. 610). Sibyl Marcuse, in her *Survey of Musical Instruments* (1975), notes that, although the instrument is often used with great ingenuity, "in parts of Europe and in India they have degenerated

into a child's toy" (p. 169). The Turkish telefon is one such instrument (see Picken 1975:155 for a map of telefon distributions across Turkey). In that country, as well as in Greece, the friction drum is primarily a children's instrument, and can be fabricated from tin cans or matchboxes. But other friction drums, such as the Turkish kaplan kabagi (lion's roar) and Greek mourgrinára (also derived from "to roar") serve more practical purposes, such as that of the Mexican tigrero: for scaring off wild animals (Ibid.:158).

Today, the friction drum in Eurasia is used as a folk instrument (qv above the der~ of western India). Direct stick friction drums such as the rommelpot and zambomba are utilized primarily for holidays in Europe: for example, the Flemish rommelpot is brought out every Christmas season, particularly during Epiphany (or Twelfth Night), when traveling musicians went door to door trading food for music on their rommelpot (Botermans et al. 1989:82). Some friction drums in Southern Europe, such as the Greek ghourghoúra and the Italian pu-ti-pù, have onomatopoeiac names. Of all the European friction drums, the zambomba of Southern Europe was the one that found its way to the New World, by way of Spain. It has direct modern descendants all over Central and South America, such as the Costa Rican juque (Salazar Salvatierra 1992:90-93) and the Venezuelan furrucó (Aretz 1967:99-106).

The friction drum rarely finds itself in orchestras; however, the occasional avant-garde piece will find a place for it. In the early twentieth-century, Edgard Varèse included the "string drum" (tambour à corde)-or as he referred to it the "lion's roar"-in two of his cutting-edge percussive pieces, *Hyperprism* (1924) and *Ionisation* (1934).

African friction drums

There are many friction drums in Africa. Most of those brought to the New World were of West African origin. Marcuse writes:

[I]f the European friction drum is often likened to a bull, that of Africa is said to resemble a leopard. Such is the dingwinti, (from kwinta, Kongo for "to roar like a leopard" 1) of the Bwende and Sundi of the Lower Congo, formerly a ritual instrument exclusively, now increasingly a secular one, and the "village leopard" of the Bapende of the same region, with its friction stick of palm-leaf rib [here recall the various palm-leaf friction drums of India] rubbed with a handful of grass or leaves, and played only during secret society initiations or at the death of members. The pattern of ritual use is manifest again among the Mamvu and the Mambutu of Zaire, among whom it is exclusively a man's instrument; women are not permitted to see it under penalty of stillbirth. By contrast, among

the Pedi of South Africa only old women play it, but then only during the initiation of young girls. [Marcuse 1975:170-171].

The friction drum is spread all throughout Sub-Saharan Africa. In Southern Africa, and South Africa, the ngoma drum of the Venda, a kind of all-purpose drum among the Bantu-speaking peoples, has been incorporated into many different types of drum, including the friction drum. Here too, the ngoma is likened to a lion, because of the "roar" that it produces when the fingers are wetted and rubbed up and down the internal stick, in this case a reed. "This produces a very real roaring, so that one might believe it to be a real lion. Those that know cry out 'There it is, here it is', and make the others afraid" (Kirby 1965:264). Kirby goes on to compare the "frictionalization" of the ngoma with friction drums from nearby regions.

This passage is exceptionally interesting, showing as it does the temporary conversion of the ngoma, which is one of the most highly developed drums in use in South Africa, and is normally beaten with a stick, into a friction drum, and that, too, as an adjunct to a girls' initiation ceremony. This use of the ngoma of the Venda may well be compared with the use of the ingungu by the Zulu and of the moshupiane by the Pedi. [Ibid.]

Like the ngoma, the Zulu ingungu is also a girls' initiation drum, played as part of the ceremony introducing her into the community after the onset of menarche. Kirby notes that "[t]he ingungu...is a true friction drum, and, moreover, an example of a friction drum in which the reed is not permanently attached to the drum skin. Since, as has been shown, the instrument itself is not permanent, the ingungu would appear to be the survival of an early stage in the evolution of this type of drum, in which the reed or cord which is made to vibrate is usually attached to the skin" (Ibid.:28-29)

More important to the development of the American friction drum were those from Western Africa. Of all those, the kwita and ekpe gave rise to the ceremonial friction drums of Cuba and Brazil, and much of Latin America in general. The kwita, for one, is utilized by various populations in central Africa such as the Chokwe and Pende of Zaire, and other peoples of Zaire and Angola. Gourlay, the writer of the "kwita" entry for the Grove's Dictionary, notes that the Pende use the kwita in ritual and warfare. A recently-made drum from the Chokwe "consists of a metal cylinder with a membrane and a wooden bar across the base" (Grove's v. II, p. 491). The very similar ekpe, or etwie, is also known as the "leopard drum". Blades notes that it "is 'headed' with the skin of a leopard shaved to paper thickness. From this is emitted the sound of a snarling leopard when a bent stick is rubbed backwards and forwards on the vellum" (1984:61). We find similar instruments in

Gabon, Congo and Equatorial Guinea. One such instrument is the osomba of Gabon. This instrument, known to the Nkomi and Mpongwè, also features an internal stick, although this stick hangs from a string that is tied to a piece of wood on the outside of the membrane. The instrumentalist plays the osomba in a ritual context, either with it laying on the ground or resting in his lap (Norberg 1989).

American friction drums

Today in Latin America we see versions of the zambomba and its variants in Europe. In Costa Rica, as Salazar Salvatierra (1992) notes, the juque (or juco) is used all over Latin America, but is clearly of Old World origin, having been brought to America by Spanish missionaries. He notes:

The juque [whose body is made of gourd] is derived from the Spanish zambomba, a middle-sized drum with an animal skin or membrane [often that of an iguana] inserted in the center with a stick greased with beeswax. The musician rubs the stick with the palm of his hand, which vibrates the membrane; thus is produced a hoarse sound used as a bass rhythm (Salazar Salvatierra 1992:90).

The author also notes that the juque took the place of bamboo cane in accompanying instruments such as the mandolin and the marimba.

Similar to the juque is the furruco, or furro, of Venezuela. Like the juque, the furruco is derived from the zambomba, although the name of the instrument is apparently of African origin (Aretz 1967:99). It, too, is fashioned from a gourd, although Aretz notes that the body of the drum may be fashioned out of many different types of materials. The drum is covered with a rabbit or young goat skin, or more recently the skin of a cat, into which a wooden stick is inserted. Aretz notes that the materials from which the furruco is made may vary from region to region. It, too, emits a sound Aretz places in the "contrabass". As with European friction drums such as the zambomba and the rommelpot, the furruco is often used around Christmastime (Ibid.:104).

Like the zambomba, we see versions of the western African friction drums in Latin America. In Cuba and Brazil, we see many instruments used in uniquely Afro-Latin American ceremonies and rituals. Among the most widely used in Brazil is the cuíca, which is directly derived from the kwita of Central Africa in form and in name. According to Holland, "the end of the wooden stick which passes through the drum is fastened in the center of the single head. The player holds the drum with one hand whilst the other is inserted into the open end, and with the help of resin vibrates the

stick, and therefore the drumhead. The resultant sound is both rasping and gravelly-quite similar to the string drum, the lion's roar, though rather higher in pitch" (1978:81).

The African-American friction drums are generally structured the same way, with a stick or a string threaded through the middle, being stroked from the inside to produce a croaking or roaring sound. The *onça*, like the *cuíca*, is a Brazilian instrument of Central African origin, and unlike that other instrument its sound is very low, often used in Yoruba ceremonies for a bass line.

Cuba has a similar blessing of instruments that ultimately derive from Africa. Among those is the *kinfúti*, or *manfúla*, a single-headed drum with an internal friction cord or stick. (Grove's 1984:v. II, p. 432). Also there is the *ekué*, derived from the *etwie*, with a loose shaft. The New Grove's Dictionary of Musical Instruments says that "it is always three-legged: each foot may be either an integral part of the wood of the drum body itself, or added to it" (v. I, p. 650), and featuring a cane shaft. The *ekué* is utilized by a secret society founded by African slaves in the nineteenth century known as the *Ñáñigos*, who use it in their rites.

Replicating the Maya Friction Drum

Armed with the above information, I set about to attempt a basic reconstruction of the Maya friction drum. Keeping in mind the tendency in various parts of the world for the friction drum to be associated with large, growling animals (particularly cats), I framed my experiment around the notion that the sound made by this Maya friction drum produced a sound that evoked a similar association to its listeners. What I first set out to do was to create one possible reconstruction of this drum, more if possible, using the information mentioned above. The creation of similarly sized notched sticks of the same material, with different numbers of notches set at different distances apart would also be key in noting what type of notching would result in a greater sound. Then I would proceed to play the instrument with any one of the notched sticks, in the same way the individual depicted on K5233 is playing it.

Problems Encountered

Material for Drum Body. As previously mentioned, the past and present Maya made their drums out of wood and clay, as well as gourd. I found wood to be the most easily obtainable at the time I conducted the experiment, though clay and gourd may be experimented with at a later date. This wood came to me in the form of a pair of cheap, untunable bongo drums with paper skins. I separated the bongos, and created two separate friction drums of the type depicted on the vase.

Dimensions of Instrument. Due to the nature of this instrument, and the fact that no specimens (to my knowledge) have survived to the present (at least in the form depicted on this vase), I found that it was impractical to account for specific dimensions. Of course, this is not to say that the Maya would not necessarily have kept certain dimensions in mind. I could have based measurements on archaeological examples of extant ceramic drums or modern Maya drums. I did not find this necessary at present, but I may use such measurements as the basis of future experiments.

Membrane for Drum. Originally, I had expected to make either one or two drums, each with animal hide for skin. With this pair of bongos and the lack of other materials at this time, I chose to use both drums in the pair of bongos. The paper skin of the smaller drum was kept intact. The other paper skin, of the larger drum, I replaced with animal (in this case, goat) hide, which would be closer to the actual nature of the drum skin of the instrument depicted on K5233.

String for Drum. Of all the possibilities before me, animal gut was recommended to me as a suitable source for string (Philip Wilke, personal communication). This was a logical choice for several reasons. Whereas in the Old World we see the use of vegetable fiber in objects such as bows, in the New World we see animal sinew used for making bows and for binding arrow points to shafts (Baker 1994:231). Animal sinew is extremely durable, as opposed to vegetable fiber (such as cotton), which is less so. This is contrary to what some bowyers may at first think, as Tim Baker (231ff) notes that "vegetable fibers are often stronger than sinew fibers":

"Primitive" strings [such as those made out of vegetable fiber] are made of two or three thick simple plies. As we have seen, such plies are weaker due to non-uniformity, and having been made thicker to compensate, they now suffer even further from the thicker-is-weaker problem. "Advanced" strings avoid both problems, being composed of many small threads.

Sinew and other animal fibers, on the other hand, are far less affected by thickness. Their more-strained outer fibers can stretch many times farther than vegetable fibers. Even when strained enough to put inner fibers to work, outer fibers are still stretched below capacity. [Baker 1994:231-232]

While the Maya might have used a cotton string in this friction drum, it is also likely they may have used animal fiber.

Attaching Membrane to Drum Body. In pictures of modern replicas of Maya drums, one can see the drum membranes attached to the drum heads with either pegs or string. Attaching the membrane

using either of these methods would be tedious and time-consuming, and I found the task much more easily completed with the use of nails, specifically furniture tacks. The end result, apparently, would not be significantly changed by using tacks (Botermans et al. 1989: passim). Admittedly, I used this method primarily for convenience sake, but was encouraged by the fact that nails are often used in modern reconstructions of Aztec huehuetls (see Stevenson 1976 Plates).

The Replication Procedure

After separating the bongos, I set about to make the sinew string for the first drum, best softened by soaking in a solution of water and saliva until sticky and pliable. Next I took the initial string when dry, then re-wetted it, folded it in half, twisted it and let it dry at the new thickness. The end result was a very strong string which was able to suspend and hold a heavy bongo without breaking. This gives me the impression that had the Maya used animal sinew string in this friction drum, a drum with an even heavier clay body could possibly have been suspended from it, not to mention one of wood or gourd. The goat hide was attached to the other drum body using furniture tacks as noted above, attached wet and allowed to dry in place.

This string was then attached to the drum membrane through a slit in its center. I tied the string around a small piece of wood put on the underside of the drum (as seen in the New Grove's Dictionary of Musical Instruments "friction drum" entry, Figure 1e). Next I wetted the knot with saliva, and allowed the knot to "glue" itself together again. To the other end of the string I attached the stick the drum hangs from (a common wooden dowel, obtained at the local construction supply warehouse). In this case I also wetted the knot and let it glue itself together. In similar fashion, I attached the goat hide drum and its corresponding wooden dowel to its sinew string. The length of the wooden dowel of each drum was kept the same.

From this point I set about making the notched sticks. For these I used common wooden dowels, similar to the ones mentioned above. On the first dowel I sawed notches one inch (2.54 cm) apart, cut into the wood at 45 degree angles. On the second dowel I made twice as many notches, each separated by 1/2 inch (1.27 cm), again cutting notches into the wood at 45 degree angles.

Playing the Friction Drum

As depicted on K5233, the instrumentalist holds the unnotched stick on the end opposite that from which the drum hangs. The notched stick is then drawn along this first stick, causing vibrations

to travel down the string, finally resonating in the membrane. Playing each drum with both notched sticks, I found several interesting facts:

- The pitch increases as the area grated by the notched stick gets farther away from the drum. The instrumentalist depicted on K5233 grates his friction drum relatively close to his hand, which would have resulted in a higher pitch.
- The closer the notches are set on the notched stick, the louder the sound created by the stick. The first stick that I made had its notches set apart at 1 "intervals. When rubbed across the unnotched stick of the goat hide drum, it created a sound that was by contrast fairly louder than that of the paper membrane drum. The sounds created by the 1/2" notched stick were comparably louder still.
- The goat hide membrane creates a louder sound than the paper membrane. When coupled with the use of animal hide membrane over paper membrane (which the ancient Maya would have done in the first place, as do their modern descendants), an even deeper sound is created.
- The size of the drum body will most likely yield a deeper sound. This last point seems logical, although I was unable to determine this from my experiment, due to each drum body having a membrane of a different substance. Simply playing the actual bongos before separating them, however, will demonstrate this fact: the larger bongo drum yields a lower pitch when struck. This, then, probably has something to do with the deeper sound of the goat hide drum, which is larger in diameter.
- If the unnotched stick is flattened, a louder sound is yielded. Upon playing this drum, one percussionist suggested to me that a louder sound could be obtained if I scraped the notched stick along a flattened surface than along a rounded one (Brian Kaminskas, personal communication). Curious, I experimented with this, and discovered upon flattening the unnotched stick that the sound could indeed be made louder if the said stick was not left completely round. Scraping the notched stick along different sides of this new, partly-flat, partly-round stick gave a greater range of sound. The sound was loudest of all when the notches were dragged along the corner of the flattened surface. I cannot presume that the Maya actually did flatten the stick from which the drum hung, but the option was there if a louder sound was desired.

- The sound created by the notched stick could have been magnified by resonators attached to said stick. It has been suggested to me that some kind of resonator, such as cowrie shell, may have been attached to the notched stick (Karl Taube, personal communication). This is not out of the question. I tested this theory by attaching cowrie and snail shells to my resonators, using ordinary wood glue (obviously unavailable to the ancient Maya). The resulting sound was not much louder than before I added the shells. However, I attribute this to the use of the wood glue. The use of some other binding medium such as sinew, which could be used to effectively "glue" on the shells, may have achieved a similar effect. Merely tying or threading the shells onto the notched stick, on the other hand, would not only cause by contrast more vibration, but would also add the sound of jingling shells to the overall sound created by the instrumentalist. This will be the basis of future aspects of this experiment.
- The sound emitted from the friction drum can be said to resemble a large animal, growling or purring. Of those for whom I played the replicated friction drum, many said upon hearing it that it sounded, or at least could be construed as sounding, like a purring or growling large animal, specifically a cat such as a jaguar. This might be attributable to the knowledge of many of the listeners that this was a replica of a Maya musical instrument, hence the immediate association of some with a jaguar. Still, given the descriptions of sounds produced by many of the friction drums surveyed here, I must say the observations of my listeners is telling.

Conclusions

So now we have the tools to arrive at some sort of idea as to just what the Classic Maya friction drum sounded like, and how it may have been used, by studying the ethnographic, archaeological, and ethnomusicological data. I believe we can come to these conclusions:

- All over the world, the friction drum is used, or at least was used, for ritualistic purposes: remember the Grove's Dictionary's assertion that it was often used for ritualistic purposes "because of the rather unearthly character of its sound" (New Grove's 1984:v. I, p. 798)? Therefore, the Maya were very likely using it for religious reasons as well.
- This is not a big stretch, considering that the Classic Maya usually portrayed important ceremonies on their artwork, unless they were deliberately painting humorous scenes. Given the actions of the characters pictured on K5233, this

procession probably falls into the former, more serious category.

- Going by that information, we can assume that the percussionist featured on the vase is of an elevated status. Further, more detailed analysis will probably reveal the particular nature or even type of ceremony being performed.
- Judging from the representation on the vase, the percussionist dangled the friction drum from his string and processed or stood while rubbing a notched stick along the stick to which the string was attached.
- In spite of the fact that it was played differently from all other friction drums studied here, we can still assume that the sound in some way resembled the animal "roar" of so many other friction drums: the tigrero, etwie, kwinti, ngoma, kaplan kabagi, and mourgrinára.
- As specifically demonstrated in the experiment, the "roar" produced is of a deep tone, and can be said to be of a "bass" or "contrabass" nature. This association with the jaguar is especially likely given the fact that the friction drummer depicted on the vase, as with the rasca player and the dancer, is wearing jaguar skins.

Given these assumptions, can we honestly say what happened to this indigenous American friction drum? Is the tigrero some modern cousin of this friction drum, and not of any from the Old World? Did the Pre-Contact friction drum depicted on K5233 exist anywhere else in the New World? Only further research can make this in any way evident.

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